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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,552	05/13/2004	Ching-Hua Chen	LKSP0033USA	3551
27765	7590	08/11/2005	EXAMINER	
NORTH AMERICA INTELLECTUAL PROPERTY CORPORATION P.O. BOX 506 MERRIFIELD, VA 22116			GEORGE, PATRICIA ANN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 08/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/709,552	Applicant(s) CHEN ET AL.	
	Examiner Patricia A. George	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☒ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Priority*

Should applicant desire to obtain the benefit of foreign priority under 35 U.S.C. 119(a)-(d) prior to declaration of an interference, a translation of the foreign application should be submitted under 37 CFR 1.55 in reply to this action.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5-12, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (USPN 6,140,224) in view of Cole et al. (USPN 5,338,975) and Kern (Handbook of Semiconductor Wafer Cleaning Technology - Science, Technology, and Applications; 1993; William Andrew Publishing/Noyes.) and Pintchovski et al. (USPN 4,822,753).

Lin discloses a method of forming a multiple barrier layers (fig. 9A, 30/28) on a substrate having at least a conducting layer (22) and having a plug (32) hole. The barrier (30/28), a Ti/TiN film (30/28), was formed by performing a chemical vapor deposition (CVD) process (col. 2, l.34), onto the substrate (20) and inner walls (see 28) of the plug (32) hole.

Lin does not disclose defect detection methods, performing an etch to remove the barrier layer, and defect detection, as in claim 1.

Cole et al. teaches forming a high density interconnect structure, with a barrier layer, that is designed for rework ability (col. 2, l. 1-2). Cole teaches the ability to rework the interconnect system is a substantial advancement as it allows damaged components to be replaced (col. 2, l.3-4).

Kern teaches defect detection and analysis (p. 604, Table 7.) which includes monitoring impurities (written on examine) for particle detection (section 4.6, para 2). Kern also teaches common wafer cleaning techniques (p. 417, Table 8.) such as: brush scrubbing the substrate to remove particles and rinsing with an aqueous sulfuric cleaning solution (p. 121, Table 2).

Pintchovski et al. teaches the method of making a contact, which includes etch (col. 4, l. 41) to remove the barrier layer (fig. 5, 24). Pintchovski teaches any selective wet etchant can be used or etching can be by reactive ion etch.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to combine the above inventions: forming Lin's barrier layer, inspecting it using Kern's defect detection, having Cole's ability to rework, etching away the existing layer using Pintchovski's removal methods, cleaning residual residue and process induced particles using Kern's scrub and rinse, to re-form Lin barrier layer, because, immediate detection and reduction of process induced particles, will reduce defect damage, resulting in fewer failing components, allowing them to be serviced versus discarded.

As for claim 2 and 12, Pintchovski teaches the etching process is a wet (col. 4, l. 44-47) or dry etching process.

As for claim 5 and 15, Kern teaches the cleaning solution is Piranha, a sulfuric acid solution (p. 121, Table 2.).

As for claim 6, Kern teaches multiple types of analysis for detecting surface contaminants (p. 310, sec. 5.2, para 2, l. 1 "surface contaminants" is written on particles), including those that influence electrical property (see section 5.2, p. 2-4).

As for claim 8, Lin discloses the barrier layer is a Ti (fig. 9A, 28) / TiN (30) film.

As for claim 9-11, Lin discloses the conducting layer is a polysilicon layer (fig. 9B, 22a), a silicide layer (22a "polysilicon" is written on silicide), and metal layer (fig. 9A, 22).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 4, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (USPN 6,140,224) in view of and Cole et al. (USPN 5,338,975) in view of Kern (Handbook of Semiconductor Wafer Cleaning Technology - Science, Technology, and Applications; 1993; William Andrew Publishing/Noyes.) and Pintchovski et al. (USPN 4,822,753) in further view of Yamazaki et al. (USPN 6,613,614).

Although the modified teachings of Lin (USPN 6,140,224 see discussion above) do teach wet etching the buried layer, the teaching fails to include the specific wet etch chemistry defined in the applicant's claims 3, 4, 13, and 14.

As for claims 3,4,13, and 14, Yamazaki teaches a wet etching process comprising phosphoric acid (col. 2, l. 64), nitric acid (col. 2, l. 65), acetic acid (col. 2, l. 65) and water (col. 2, l. 65) where the ratio is 85:5:5:5. Yamazaki teaches a ratio of 42.5 of phosphoric acid where 38-41 is claimed. Yamazacki teaches 2.5 nitric acid to the claimed 1-1.5; 2.5 acetic acid to the claimed 1.8-2.1; and 2.5 water to the claimed 2.8-3.2. The applicant does not subscribe any criticality to the claimed ratio and the quantities and Yamazaki's teaching is within very close proximity to the claimed range.

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Comparison of the claimed amount to Yamazaki's amount shows no reason the solutions would function differently.

It would have been obvious to one ordinary skill in the art at the time of invention was made, to include the wet etch chemistry of Yamazaki in the modified teachings of Lin because Yamazaki teaches a formula that has known results of a high yield factor and excellent ohmic contact (col.3, l.8-9).

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: USPN 5,885,900, USPN 6,368,410, and USPN 6,396,147.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571) 272-5955. The examiner can normally be reached on weekdays from 7:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
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PAG

NADINE G. NORTON  
SUPERVISORY PATENT EXAMINER

